

REMARKS/ARGUMENTS

In the April 28, 2003 Office Action, the Examiner rejected claims 1-74 pending in the application. This Response amends claims 36, 57, 69-70 and 72 for consideration. After entry of the foregoing amendments, claims 1-74 (6 independent claims; 74 total claims) remain pending in the application. Reconsideration is respectfully requested.

Claims 1-5, 9-12, 14-22, 25-28, 35, 36, 38, 40-43, 45, 53-59, 65-68 and 70-73 stand rejected under 35 U.S.C. §102(b) as being anticipated by Uzoh et al., U.S. Patent No. 5,911,619, issued June 15, 1999 (hereinafter "Uzoh"). More specifically, the Examiner states that Uzoh is directed to a method and apparatus for planarizing a metallic layer on a semiconductor wafer and includes a polishing pad, a platen and a platen electrode, which is an electrical conductor, disposed in the platen and connected to the negative terminal of a power supply. The Examiner also states that the Uzoh apparatus discloses a workpiece carrier adapted to receive a positive charge from a power supply and to press the workpiece against the polishing pad, as well as a drive shaft to turn the platen. Accordingly, the Examiner contends that all of the elements recited in Applicants' independent claims 1 and 57 are disclosed by Uzoh. The Examiner further contends that Uzoh discloses supplying an electrolytic solution through a conduit to a polishing surface of the polishing pad and applying a potential difference between the metallized surface of the workpiece and the platen electrode to remove a portion of the metallized surface. The Examiner also states that Uzoh discloses that the apparatus may include a plurality of contact elements at least partially disposed in the polishing pad. Accordingly, the Examiner contends that all of the elements of the Applicants' independent apparatus claim 70 and all of the steps of Applicants' independent method claim 72 are disclosed by Uzoh.

The Examiner also contends that Uzoh discloses removable cathode contact elements made of copper mesh which is a low resistance inorganic fiber material as claimed in Applicants' claims 2 and 65. The Examiner also contends that Uzoh

discloses specific elements claimed in other claims presented by Applicants and particularly points out the following:

- 1) the polishing pad can be made of a conventional soft fabric or hard polyurethane which are insulating materials as defined in Applicants' claim 3,
- 2) the polishing pad has sufficient porosity such that an ionic current can flow through the pad to the slurry and to the layer on the workpiece as in Applicants' claim 4,
- 3) the porosity would provide the fluid communication recited in Applicants' claim 58,
- 4) Uzoh discloses a conduit to supply electrolytic planarizing solution to a polishing surface of the polishing pad as in Applicants' claim 5,
- 5) the polishing pad may include air gaps creating grooves or windows meeting the limitations of Applicants' claims 9 and 10,
- 6) a drive shaft turns the platen and polishing pad and an arrow in Figure 7 shows that the workpiece carrier rotates like the workpiece carrier shown in prior art apparatus which thereby meets the limitations of Applicants' claims 11, 12, 38 and 66,
- 7) removable cathodes may be made of copper and the electrode and the platen may be separate parts or may be formed integrally, suggesting the limitation of Applicants' claim 14 that at least a portion of the platen comprises copper,
- 8) suitable slurries for initial and intermediate stages of metal removal include sulphuric acid, hydrogen peroxide, benzotriazole and a non-ionic surfactant in combination with water and silica or alumina suggesting limitation of Applicants' claims 15, 19-22 and 53-56,
- 9) the metallized surface to be planarized may be made of copper as in Applicants' claim 16,
- 10) the removable cathode contacts may be made of copper mesh meeting the limitation of Applicants' claim 17 which recites inorganic fibers,

11) the pressure applied to the wafer may be in the range of $\frac{1}{2}$ to 8 psi overlapping the range recited in Applicants' claims 18 and 43,

12) a variety of electrical waveforms may be applied between the layer and the electrode adjacent to the polishing pad including steady DC, pulsed DC with a single polarity and pulsed DC with alternating polarity meeting the limitations of Applicants' claims 25-27 and 40-42,

13) Uzoh discloses that it is known to perform planarization under controlled temperature conditions meeting the limitation of Applicants' claim 28,

14) a more gentle slurry may be used during the final stages of planarization as in Applicants' claims 35 and 45, and

15) any suitable endpoint detection arrangement can be used as in Applicants' claims 67-68.

Uzoh generally discloses a method of planarizing a layer of a workpiece such as a semiconductor wafer which includes rotating the layer against an electrolytic polishing slurry and flowing an electrical current through the slurry and through only one major side and/or minor sides of the layer to remove portions of the layer. More specifically, the apparatus includes a rotatable workpiece carrier, a rotatable platen arranged proximately to the carrier, a polishing pad mounted on the platen, and workpiece electrodes. The workpiece electrodes are movably attached to the carrier to engage electrically the minor sides of a layer when a workpiece is held on the carrier.

In Uzoh, a power source 80 is connected to a workpiece carrier 66 which includes a plurality of workpiece electrodes 67 disposed in a recess on the carrier (see Figure 10) which provides a positive charge to the workpiece carrier 66. The power source 80 is also used to provide a negative charge to a rotatable shaft 68 which is attached to a rotatable platen 62. A platen electrode 63 is attached to the platen and a polishing pad 64 is mounted on the platen. The polishing pad 64 may also include removable copper mesh cathodes disposed within channels formed within the pad (see Figure 11B).

In contrast to the method and apparatus disclosed in Uzoh, Applicants' claimed invention is directed to a platen which is configured to have a negative charge and at least one electrical conductor positioned within the platen where a power source supplies a positive charge to the electrical conductor positioned within the platen. Uzoh fails to disclose applying a positive charge to any electrical conductor contained within either the platen or the polishing pad. Uzoh fails to contemplate the placement of any electrical conductors within the platen or polishing pad which are provided with a positive charge to create an electric potential difference between the metallized surface of a workpiece and the negatively charged platen and/or polishing pad. Applicants' positioning of the electrical conductors (to which a positive charge is applied) within the platen facilitates creation of a uniform electric potential gradient across the surface of the wafer, reducing the likelihood that edge effects and the like may result. Accordingly, all of Applicants' independent claims 1, 36, 57, 69-70, and 72 (as well as their variously depending claims) are not anticipated by Uzoh and Applicants respectfully request the withdrawal of the rejection of Applicants' patent claims under 35 U.S.C. §102(b).

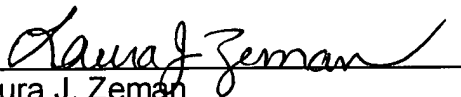
Other claims presented by Applicants also stand rejected under 35 U.S.C. §103(a) for various reasons. More specifically, claims 6-8, 37 and 60 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Uzoh et al. in view of Yamamoto, U.S. Patent No. 5,853,317 (hereinafter "Yamamoto"), claims 61-64 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Uzoh in view of Yamamoto as applied to claims 6-8, 37 and 60, and further in view of Berman et al., U.S. Patent No. 5,882,251 (hereinafter "Berman"), claims 13, 39, 69 and 74 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Uzoh in view of Bibby, Jr. et al., U.S. Patent No. 6,106,662 (hereinafter "Bibby"), claims 23 and 44 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Uzoh in view of Tsai et al., U.S. Patent No. 5,575,706 (hereinafter "Tsai"), claims 24 and 52 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Uzoh in view of Rostoker, U.S. Patent No. 5,265,378 (hereinafter "Rostoker"), claims 29-31 and 46-48 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Uzoh in view of Marcyk et al., U.S. Patent No. 6,121,144 (hereinafter "Marcyk") and claims 32-34 and 49-51 stand rejected under 35

U.S.C. §103(a) as being unpatentable over Uzoh in view of Marmillion et al., U.S. Patent No. 5,934,977 (hereinafter "Marmillion") and Zubak, U.S. Patent No. 3,849,272 (hereinafter "Zubak").

Like Uzoh, neither Yamamoto, Berman, Bibby, Tsai, Rostoker, Marcyk, Marmillion and/or Zubak, either alone or in combination, disclose an apparatus having a platen comprising conductive material configured to have a negative charge and at least one electrical conductor positioned within the platen where a power source applies a positive charge to the electrical conductor contained within the platen to create an electrical potential difference between the metallized surface of a workpiece and the platen to remove at least a portion of the metallized surface from the workpiece. Accordingly, it would not have been obvious to one of ordinary skill in the art to combine Uzoh with Yamamoto, Berman, Bibby, Tsai, Rostoker, Marcyk, Marmillion, and/or Zubak to arrive at any of the Applicants' claims. Accordingly Applicants respectfully request the withdrawal of the rejection of Applicants' claims under 35 U.S.C. §103(b).

In view of the foregoing, Applicants respectfully submit that all of the pending claims fully comply with 35 U.S.C. §112 and are allowable over the prior art of record. Reconsideration of the application and allowance of all pending claims is earnestly solicited. Should the Examiner wish to discuss any of the above in greater detail or deem that further amendments should be made to improve the form of the claims, then the Examiner is invited to telephone the undersigned at the Examiner's convenience.

Respectfully submitted,

By 
Laura J. Zeman
Reg. No. 36,078

SNELL & WILMER L.L.P.
One Arizona Center
400 East Van Buren
Phoenix, Arizona 85004-2202
Telephone: (602) 382-6377
Facsimile: (602) 382-6070